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CASE REPORT

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Renal calyceal rupture with extensive urinoma formation as a complication of cervical cancer

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Abstract

Renal calyceal rupture (RCR) is a rare phenomenon most commonly caused by increased renal pelvic pressure from ureteral obstruction. This can occur in the setting of acute obstruction such as with kidney stones and is not commonly seen as a consequence of malignancy due to the chronic nature of obstruction. In this case, we describe a patient with newly diagnosed cervical cancer presenting with thigh pain who was found to have a urinoma from RCR caused by malignant obstruction. We discuss the workup of a pelvic mass presenting as flank pain, as well as the role of history and physical exam when reviewing imaging. We also review the management of RCR in the setting of malignant obstruction. Lastly we highlight the alterations to cervical cancer treatment due to the presence of the infected urinoma.

Keywords

Cervical cancer; Urinoma; Renal calyceal rupture

1. Introduction

Renal calyceal rupture (RCR) is a rare complication of obstructive uropathy which is caused by increased renal pelvis pressure leading to calyceal rupture. RCR is most commonly caused by acute obstructing renal stones, accounting for 75–80% of cases [1]. Rare causes include pregnancy, posterior urethral valves, urinary retention and iatrogenic injury [1, 2]. Malignancy is a rare cause of RCR and is only described in a few case reports of prostate cancer, testicular cancer and gynecologic malignancies [1, 3]. In this case, we describe an unusual presentation of RCR secondary to locally advanced cervical cancer with extensive urinoma presenting as thigh pain and diagnosed on positron emission tomography computed tomography (PET CT) imaging. We also discuss management of the treatment of this large urinoma, and the impact of this event on the ability to initiate definitive cervical cancer treatment.

2. Case presentation

A 69-year-old female with no known medical history presented to the emergency department with three days of progressive upper abdominal pain associated with anorexia, constipation and emesis. She also noted a 20 kg unintentional weight loss over the past year, as well as a few years of postmenopausal bleeding. She denied flank pain, urinary symptoms or fevers. Physical exam was significant for tenderness to palpation in the right upper abdominal quadrant without rebound or guarding. Laboratory results were significant for a hemoglobin of 5.9 g/dL (11.6–15.0 g/dL) and creatinine of 0.8 mg/dL (0.59–1.04 mg/dL). No abnormalities were seen on urinalysis. She received 2 units of packed red blood cells with a subsequent rise in hemoglobin to 7.9 g/dL.

Due to the right upper quadrant pain, an abdominal ultrasound was acquired and was negative for cholecystitis but did show right-sided hydronephrosis with debris suspicious for pyelonephritis. A CT abdomen and pelvis was obtained and revealed an infiltrating centrally necrotic mass of the lower uterine segment, likely the cervix, which extended into the periuterine fat, and invaded the posterior bladder, anterior rectum, upper vagina and likely the distal right ureter. It also showed right pelvocaliectasis with renal parenchymal atrophy, perinephric edema and decompressed right ureter. Thickening of the transverse colon was also seen with partial colonic obstruction. Tumor markers were drawn (Cancer Antigen-125 and Cancer Antigen 19.9) and were both within reference range (16 U/mL and 1.4 ng/mL respectively).

She was admitted for further work up and biopsy. Urology was consulted and placement of nephrostomy tube was discussed but ultimately deferred due to atrophic right kidney that was suspected to be nonfunctional due to chronic obstruction. The right ureter was nondilated and renal function was preserved on laboratory evaluation with an estimated glomerular filtration rate (eGFR) of 79. Gynecologic surgery was consulted as the differential diagnosis included uterine or cervical malignancy with cervical cancer being high on the differential diagnosis. Colon and ovarian were less likely due to the normal CA-125 and CA19.9. A colonoscopy was performed which did not reveal any endoscopic evidence of stenosis, strictures, masses or ulcerations. Biopsy of the pelvic mass revealed human papillomavirus-related high-grade squamous cell carcinoma which was strongly reactive to p16. The patient

was subsequently discharged home with medical oncology and radiation oncology follow up scheduled.

During her medical oncology appointment a few weeks later, she described worsening right sided abdominal pain, right thigh pain and new swelling in the right thigh that expanded over a few days. She also endorsed decreased appetite and early satiety. Physical exam was notable for pitting edema of the lower extremities, right greater than left, along with a fullness in the right thigh that extended halfway to the knee. Laboratory tests were significant for a leukocytosis of 20.5 $\times$ 10^9 (3.4–9.6 $\times$ 10^9) and creatinine of 0.75 mg/dL, which was noted to be 1.3 mg/dL at a primary care appointment one week prior. There was concern that this could signify rapid disease progression. She underwent staging PET CT imaging which showed a homogeneous area of intense Fluorodeoxyglucose (FDG) uptake from the posterior right kidney along the retroperitoneum and psoas/iliopsoas musculature into the proximal medial right thigh and extended past the last image of the scan at the knee (Fig. 1). The cervical mass appeared to involve the periuterine fat, vagina, posterior bladder wall, anterior rectum and distal right ureter and did not seem significantly unchanged from prior imaging. The FDG uptake in the pelvis was initially concerning for locally advanced disease, although in an unusual pattern of spread. After physical exam and discussion with the radiologist, it was determined that the large FDG area on PET CT represented a urinoma likely secondary to rupture of the upper pole of the right kidney due to hydronephrosis from progressive malignant obstruction of the right ureter rather than rapid tumor spread, as initially suspected. To quantify the size of the fluid collection, a CT urogram was obtained. CT urogram revealed the interval calyceal rupture involving the upper pole of the right kidney with the large urinoma (approximately 36 cm) involving the retroperitoneum tracking down to the upper right leg. The right hydronephrosis appeared to be caused by the tumor which was obstructing the distal ureter (Fig. 2).

The patient was hospitalized for expedited multidisciplinary treatment of the symptomatic urinoma. The patient received percutaneous drains to the right perinephric, right retroperitoneal and right upper leg fluid collections. She was not a candidate for nephrostomy tube placement due to the calyceal rupture. The right perinephric tube was in contact with the ruptured calyx and drained the right kidney appropriately. A CT urogram was repeated 48 hours after tube placement and showed interval decrease in all three fluid collections. Additionally, it showed a multiloculated rim-enhancing collection in the adductor compartment musculature of the proximal right thigh concerning for infection. Broad spectrum intravenous antibiotics were initiated, and the right thigh fluid collection was drained and cultured. Cultures grew *E. coli* and antibiotics were narrowed based on susceptibilities.

Intermittent sinograms were performed to assess for adequate drainage of the infected urinoma. A nuclear medicine kidney scan with technetium 99m mertiatide (Tc-99m MAG3) was obtained to assess kidney function. This showed minimal angiographic perfusion of the right kidney with 8% renal function, while the left kidney was preserved with 92% function. CT imaging revealed severe right renal cortical thinning and atrophy. Because the right kidney was felt to be essentially

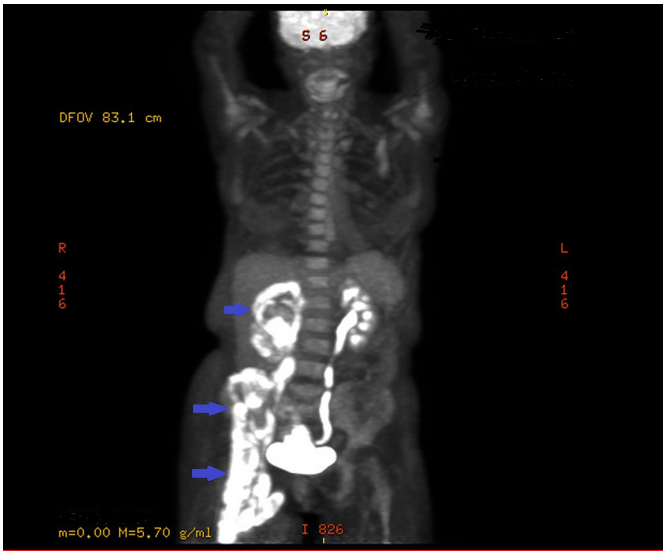

FIGURE 1. PET Scan. PET scan showing right kidney hydronephrosis, along with an extensive urinoma adjacent to the inferior pole of the right kidney extending into the right retroperitoneum and into the right upper medial thigh (blue arrows).

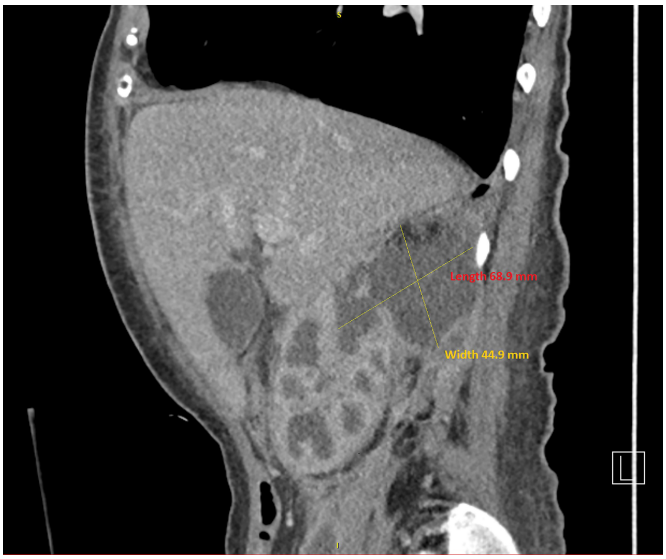

FIGURE 2. CT Urogram. CT urogram demonstrating calyceal rupture of the upper pole of the right kidney with formation of a urinoma, that begins posterior to the kidney and tracks through the retroperitoneum.

nonfunctioning, removal of the kidney was not recommended and would also delay cancer directed therapy. Throughout her hospitalization her creatine remained within reference range. Creatinine value from the drain was attempted but unable to be obtained as the drain fluid was too viscous.

Although optimal therapy for locally advanced cervical cancer is considered chemoradiation with sensitizing cisplatin, due to infection chemotherapy was deferred, and radiation therapy (RT) was initiated with curative intent. Her kidney function was followed closely during radiation with weekly creatinine levels. The drain remained in place throughout the course of RT and was removed once the fluid cavities were

noted to be collapsed which was approximately 8 weeks after initial placement. She remained on antibiotics for a total of 10 weeks. After administration of 25 fractions of RT to her pelvic and 5 fractions of brachytherapy to cervix, repeat imaging showed significant reduction in tumor burden, improvement in fluid collections, and alleviation of right sided hydronephrosis. She developed left sided hydronephrosis after RT which was treated with robotic ureteral reimplant. Follow up CT Urogram at 9 months and 1 year after treatment showed no urinoma, persistent, but stable right renal atrophy, and stable ureterectasis of left kidney. Her creatinine remained stable on follow up testing with a baseline of 1.2 mg/dL. Surveillance PET CT imaging at 3 months post radiation showed minimal residual FDG uptake at the cervix, and she remains free of recurrence to date.

3. Discussion

We describe a case of RCR initially suspected to be rapid spread of FDG avid cervical cancer. Further evaluation led to the diagnosis of RCR due to a cervical mass compressing the ureter. Diagnosis of a urinoma was confirmed with a CT urogram, which can help visualize the extravasation of fluid and the extent of the fluid collection. Small urinomas can resorb spontaneously and while larger collections typically require treatment with percutaneous drainage, stent placement or open surgery to reduce the risk of complications such as infection [4]. In a stable patient with an identified cause of the urinoma, percutaneous drainage is preferred before definitive treatment of the ureteral obstruction [5]. Untreated urinomas can lead to further complications including urinary peritonitis, fibrosis, fistula formation, abscesses and septic shock [4]. Given the extensive urinoma with concern for infection, our patient received a percutaneous drain that was adequately decompressing the right kidney along with an extended course of intravenous antibiotics.

Recommended treatment for locally advanced high grade squamous cell carcinoma includes pelvic external beam radiation (EBRT) with concurrent platinum containing chemotherapy and brachytherapy. Chemoradiation has been shown to have greater disease-free survival and overall survival benefits compared to radiation therapy alone [6]. Due to RCR and subsequent infected urinoma with renal injury, definitive treatment was modified and chemotherapy was not initiated [6]. In cases where chemotherapy is utilized, consideration with cisplatin should be taken due to its known nephrotoxicity [7]. Instead of chemotherapy, our patient underwent pelvic radiation therapy and brachytherapy to the cervix, leading to reduction in tumor burden and resolution of the urinoma collection. After completion of radiation therapy, the patient had improvements in anemia, vaginal bleeding and functional status (Eastern Cooperative Oncology Group performance status 1 to 0). She remains disease free at last evaluation approximately 1 year from diagnosis.

RCR with urinoma formation due to a pelvic malignancy has been rarely described [3, 8, 9]. Compression of the urinary collection system by masses can result in hydronephrosis, which can progress to RCR with urinoma formation. Hydronephrosis and urinoma can present with flank pain and fevers if infection is present. Our patient presented to oncology clinic with right thigh pain due to extension of an extensive urinoma from malignant obstruction caused by invasive cervical cancer. Her imaging and worsening symptoms were initially attributed to rapid disease progression, but with further evaluation were due to an extensive urinoma after RCR [4–6].

4. Conclusions

In this case, we present a patient with leg pain and swelling as a symptom of an extensive urinoma caused by RCR from malignant obstruction. We also discuss the management of RCR and urinoma, which includes percutaneous drainage, along with cervical cancer treatment modification as a consequence of the infected urinoma. As RCR with urinoma formation is a rare consequence of malignancy, there is not a standardized treatment approach. We describe a system for evaluating and treating malignant RCR with urinoma formation including serial CT urograms, percutaneous drainage, and cancer treatment modification [10]. Through multidisciplinary care, the patient was able to initiate cancer directed therapy while being treated for the RCR with large, infected urinoma; although, it did require modification of the definitive therapeutic approach. She was able to complete her cancer directed therapy and was able to retain the function of her remaining kidney and at the time of submission remains disease free.

ABBREVIATIONS

RCR, renal calyceal rupture; EBRT, external beam radiation; PET CT, positron emission tomography computed tomography; EGFR, estimated glomerular filtration rate; FDG, uorodeoxyglucose; Tc-99m, G3 technetium 99m mertiatide; RT, diation therapy; EBRT, ternal beam radiation; ECOG, stern Cooperative Oncology Group performance status; IV, Intravenous; CA, Canger antigen; HPV, Human papillomavirus.

AVAILABILITY OF DATA AND MATERIALS

The data generated in this study are available upon request from the corresponding author. All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

AUTHOR CONTRIBUTIONS

AEWH—conception, manuscript writing, editing and supervision. AH—manuscript writing and editing. SS—manuscript writing and editing. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was performed in line with the principles of the Declaration of Helsinki. Since it is not a clinical trial, it wasn't required to be submitted to the Mayo Institutional Review Board. Written informed consent was obtained from

the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor of this journal on request.

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CONFLICT OF INTEREST

Andrea E. Wahner Hendrickson discloses grant and contract involvement from TORL therapeutics (Site PI), ProLynx (Investigator-initiated clinical trial), and P50 CA 136393 NCI grant (Co-project leader of Ovarian cancer SPORE). All other authors declare no conflicts of interest.

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